

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 2, 2018/2019

### POC0335 – ORGANIC CHEMISTRY

(Foundation in Life Sciences students only)

5 March 2019  
2.30 p.m – 4.30 p.m

(2 Hours)

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#### INSTRUCTIONS TO STUDENT

1. This question paper consists of 5 pages with 5 questions only.
2. Answer **ALL** questions.
3. Please write all your answers in the answer booklet provided.
4. Distribution of marks for each question is given.

**Instructions:** Answer ALL questions.

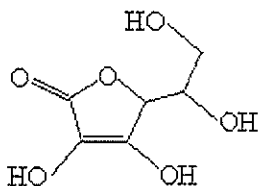
**Question 1 [10 marks]**

- a. Below is the structure of 1-Chlorobutane. Draw three other possible isomers and determine which of them (if any) is/are chiral. [mark the stereocenter with an asterisk (\*)].

[2 marks]



- b. Based on the structure below:



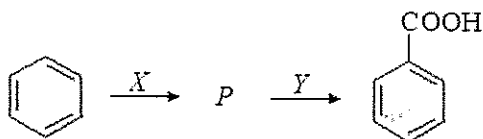
- (i) Determine the molecular formula. [½ mark]  
(ii) Name all the functional groups present. [1½ marks]
- c. (i) The boiling point of pentane is higher than its isomer, 2,2-dimethylpropane. Explain. [1 mark]  
(ii) Ethanol, C<sub>2</sub>H<sub>5</sub>OH is soluble in water. Explain. [1 mark]
- d. Use the reaction between propene and hydrogen iodide, explain Markovnikov's rule. [2 marks]
- e. The souring of wine (which is essentially an aqueous solution containing ethanol) is due to the formation of ethanoic acid. This is brought about by atmospheric oxidation. Write the chemical equation for this reaction. [1 mark]
- f. Which of the following has the highest boiling point? Why? [1 mark]

1-Pentanol	1,2-Pentanediol
2-Pentanol	1,2,3-Pentanetriol

**Continued.....**

**Question 2 [10 marks]**

a. Consider the reaction below:



What is  $X$  and  $Y$ ?

[2 × 1 mark]

b. Benzene can be nitrated to nitrobenzene, via electrophilic substitution. Write a balanced equation for the reaction. [1 mark]

c. Benzene, methylbenzene and nitrobenzene all undergo electrophilic substitution with chlorine in the presence of aluminium chloride.

(i) Draw the structural formula of the compounds formed from the above reaction.

[3 × ½ mark]

(ii) State the function of aluminium chloride.

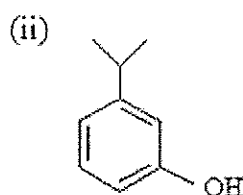
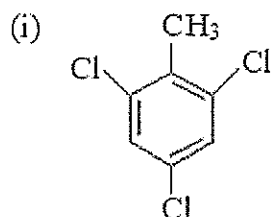
[½ mark]

(iii) Arrange the three compounds in increasing order of reactivity towards electrophilic substitution. Explain your answer.

[2 × ½ mark]

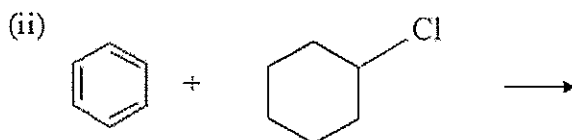
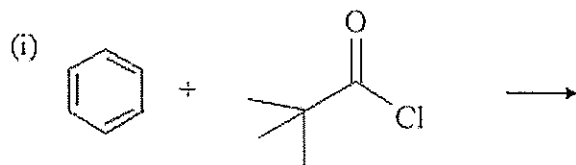
d. Give the IUPAC name for the following structures:

[2 × 1 mark]



e. Complete the following reactions by giving the structures of the products formed.

[2 × 1 mark]



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**Question 3 [10 marks]**

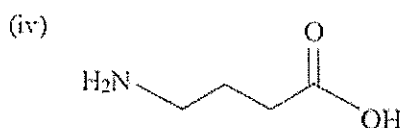
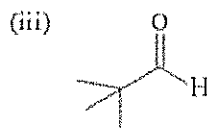
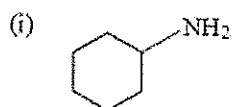
a. Draw structural formulas for these compounds: [2 × 1 mark]

- (i) 4-Phenyl-3-hexanone
- (ii) 2-Hydroxyl-4-oxo-hexanoic acid

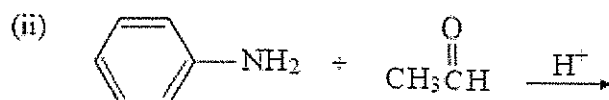
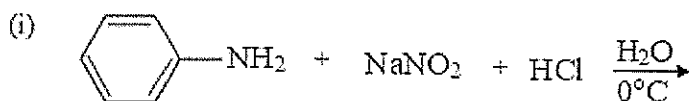
b. Write an equation (show reactants and products) for each of the following reactions: [2 × 1 mark]

- (i) Benzaldehyde is reduced using lithium aluminium hydride.
- (ii) Benzaldehyde is oxidised using chromic acid.

c. Give the IUPAC name for the following structures: [4 × 1 mark]



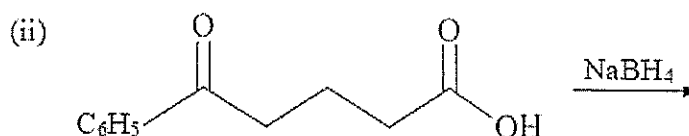
d. Complete the following reactions by giving the structures of the products formed. [2 × 1 mark]



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**Question 4 [10 marks]**

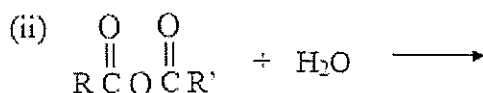
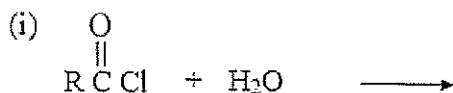
a. Draw the structure(s) of the organic product(s) formed in each of the following reaction:  
[2 × 1 mark]



b. Give the formula of the acid and alcohol that will produce the following ester.  
[2 × 1 mark]

- (i) Propylmethanoate  
(ii) Phenylbenzoate

c. State the class of the reactants and write the general formula of the products formed for the hydrolysis reactions below:  
[2 × 1½ marks]



d. Nitriles are compounds having the general formula of  $\text{RC} \equiv \text{N}$ . Hydrolysis of the nitrile compounds in acidic solution produces carboxylic acids. Alkaline hydrolysis, on the other hand produces carboxylate ions. Write a balanced equation for each of these reactions.  
[2 marks]

e. The  $\text{p}K_{\text{a}}$  for three compounds are given in the table below:

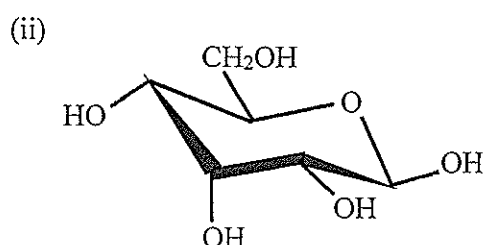
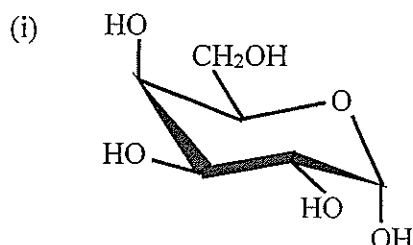
Compound	Benzoic acid	4-Nitrobenzoic acid	4-Methylbenzoic acid
Structure	<chem>C6H5COOH</chem>	<chem>NO2C6H4COOH</chem>	<chem>CH3C6H4COOH</chem>
Acid dissociation constant, $K_{\text{a}}$	$6.3 \times 10^{-5}$	$4.0 \times 10^{-4}$	$6.0 \times 10^{-11}$

Arrange the three compounds in order of increasing acid strength.  
[1 mark]

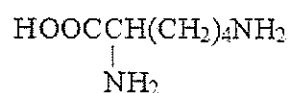
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**Question 5 [10 marks]**

- a. Convert each chair conformation to an open-chain form & then to a Fisher projection:  
[2 × 2 marks]



- b. The amino acid lysine has the following structure:



- (i) Give the IUPAC name for lysine. [½ mark]  
(ii) Draw the structure of lysine in the solid state where it exists in the form of zwitterions. [1 mark]  
(iii) Two molecules of lysine can react to form a dipeptide.  
(1) What is the name of this reaction? [½ mark]  
(2) Draw a possible structure of the dipeptide formed. [1 mark]  
(iv) The isoelectric point of lysine is 9.74. Toward which electrode does lysine migrate during paper electrophoresis at pH 7.0? Explain briefly. [1 mark]
- c. Briefly describe the following terms: [2 × 1 mark]
- (i) Electrophoresis  
(ii) Peptide bond

**End of Paper**